AL.1.148

ENERGY RESOURCES CONSERVATION BOARD
Calgary Alberta

DECISION ON AN APPLICATION BY ESSO CHEMICAL CANADA FOR AN INDUSTRIAL DEVELOPMENT PERMIT TO MANUFACTURE AMMONIA AND UREA

Decision 80-17
Application 800304

1 APPLICATION AND HEARING

Esso Chemical Canada applied, pursuant to section 42, subsection (2), of The Oil and Gas Conservation Act (the Act) for industrial development permits which would authorize the use of gas in the manufacture of ammonia at its existing plant near Redwater, Alberta, and ammonia and urea at an expansion of this facility. The requested permits would approve the use of up to 991 x 10^6 cubic metres (m^3) per year for manufacturing 225 000 tonnes of ammonia at the existing facilities and 584 000 tonnes of ammonia at the new plant. Initially, some 40 per cent of ammonia from the new facility, later increasing to 50 per cent, would be converted to urea. Authorization for increased gas use in the existing plant was requested to commence with issuance of the permit and to continue for 25 years. The permit term requested for the new units was 25 years commencing with start-up, projected for 1983.

A public hearing of the application took place in Edmonton, Alberta on 28 and 29 July 1980, with V. Millard, N. Berkowitz, P.Eng., and H. J. Webber, P.Eng., sitting.

Sherritt Gordon Mines Limited, the only intervener, appeared for the purposes of cross-examination and argument. The participants at the hearing are listed in Table 1.

TABLE 1 THOSE WHO APPEARED AT THE HEARING

Principals and Representatives (Abbreviations used in Report)	Witnesses
Esso Chemical Canada (Esso) W. J. Hartnett	J. R. Haggerty, P.Eng. R. W. Hodgson, P.Eng. K. C. Johnson, P.Eng. W. S. Pick, P.Eng. T. Razzaqi G. W. Zelt, P.Eng. R. S. Custer, P.Eng. of Bechtel Corporation J. C. Reynolds, P.Eng. of C & I Girdler Incorporated Dr. R. W. Wright of Wright-Mansell Research Ltd.

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TABLE 1 THOSE WHO APPEARED AT THE HEARING (cont'd)

Principals and Representatives (Abbreviations used in Report)	Witnesses
Sherritt Gordon Mines Limited (Sherritt Gordon) H. R. Ward	
Energy Resources Conservation Board staff M. J. Bruni J. D. Dilay, P.Eng. G. R. Nadeau K. M. Johnston	

2 BACKGROUND

Esso applied for an industrial development permit authorizing the annual use of 671 x 10^6 m^3 of gas as fuel and feedstock for production of ammonia and urea in new facilities that would expand its existing plant near Redwater. The existing plant is exempt from section 42 of The Oil and Gas Conservation Act for annual use of 303 x 10^6 m^3, but the applicant indicated at the hearing that this volume was insufficient for the current capacity of the plant, and therefore also sought authorization for an additional annual use of 17 x 10^6 m^3 in the existing unit. The requested permits would thus authorize a total annual use of 991 x 10^6 m^3 of gas for existing and proposed new ammonia/urea capacity.

3 ISSUES

Having regard for its responsibilities under section 42 of the Act, the Board considers the primary issues to be:

(a) whether gas is an appropriate feedstock and fuel for the proposed plant, and if so, whether it would be efficiently used, and

(b) the applicant's gas requirements and the availability of gas in Alberta.

Additional matters raised at the hearing and meriting consideration are:

(c) the markets for ammonia and urea to be produced at the proposed plant,

(d) the impact of the proposed project on the Alberta economy, and

(e) permit terms, Alberta and Canadian content, environmental and social impact.

4 APPROPRIATENESS OF GAS AS FEEDSTOCK AND FUEL FOR THE PROPOSED PLANT AND ITS EFFICIENCY

4.1 Appropriateness of Gas as Feedstock and Fuel in the Manufacture of Ammonia

In support of its choice of gas as feedstock and fuel for the proposed facility, Esso submitted an economic analysis for an alternative coal-based operation. It indicated that it had made a preliminary analysis in early 1978 and had completed the more detailed analysis submitted in 1979. It estimated the capital cost of a coal-based plant at some $910 million as compared with approximately $250 million for a gas-fed facility, and indicated that this disparity would not begin to be offset by lower feedstock and fuel costs before the early 1990s (i.e. some 10 to 12 years after plant start-up). Esso stated that an important reason for the differential in construction costs was the additional two-year construction period which would be required for the coal-based facility. The additional two years would delay plant completion to 1985 and would increase the capital costs from some $650 million to $910 million estimated by the applicant.

While Esso acknowledged the technical utility of coal as feedstock and fuel for production of ammonia, it considered the costs of a coal-based plant prohibitive, and explicitly stated that it would not proceed with such a plant.

The Board has reviewed the applicant's cost estimates for a gas and a coal-based ammonia plant, and agrees that prevailing circumstances, especially when viewed in light of Esso's intent to locate the proposed facility adjacent to its existing fertilizer plant near Redwater, still favour gas as feedstock and fuel for an ammonia plant scheduled to begin operation before 1985.

However, the Board has some serious reservations about the pricing assumptions which underlie the applicant's cost estimates for a coal-based ammonia plant. It notes, in particular, that the two-year-longer construction period is predicated on the applicant's rejection of coal as feedstock and fuel in early 1978. That internal decision made the applicant proceed with detailed design studies for a gas-based facility without undertaking similar work on a coal-fed plant, and consequently prevented a realistic appraisal of coal as an alternative feedstock and fuel at this time.

In view of the projected growing disparity between gas and coal prices in Alberta, and of commercial coal-based petrochemical developments in other jurisdictions, the Board reiterates its view, expressed in an earlier report[1], that future grassroots facilities for manufacture of ammonia and similar petrochemical products may prove to be more advantageously based on coal than on gas. The Board would encourage more serious consideration of this matter.

4.2 Efficient Use of Gas

Esso stated that the proposed plant would convert gas to anhydrous ammonia and by-product carbon dioxide, with hydrogen for ammonia synthesis being produced by conventional steam-reforming of natural gas. Some of the ammonia and carbon dioxide would then be further converted into urea. The ammonia synthesis would use the ICI low pressure technology, but improved plant design would make the facility one of the most energy efficient built to date. Gas turbine exhaust would supply preheated combustion air for the primary reformer furnace; waste heat from ammonia synthesis would be used to generate steam for the existing as well as the proposed new ammonia and urea units; and a purge gas recovery unit would recover hydrogen from recycled synthesis gas. These, and other, design features would result in a net energy consumption of 28.5 gigajoules per tonne of ammonia.

The Board is satisfied that Esso's proposal represents up-to-date technology and would be an efficient use of gas.

5 ESSO'S GAS REQUIREMENTS AND THE AVAILABILITY OF GAS IN ALBERTA

Esso's annual gas requirement would be 320 x 10^6 m^3 for the existing plant and 671 x 10^6 m^3 for the proposed new units. The applicant has discussed gas supply alternatives with, among others, its current supplier Northwestern Utilities Limited, which provided gas for the existing plant since 1969. Esso foresaw no problems in contracting for its future increased demand.

The Board is satisfied that sufficient gas is available in Alberta for the proposed use over the requested permit terms, but would require Esso to advise the Board of satisfactory arrangements for the supply of gas for the project.

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[1] In the Matter of an Application of Alberta Gas Chemicals Ltd. ERCB Report 76-E, August 1976.

6 MARKETS FOR THE PROPOSED AMMONIA AND UREA PRODUCTION

Esso indicated that, initially, some 40 per cent of the proposed 524 000 tonnes annual production would be converted to urea. Ammonia and urea would primarily be marketed in Western Canada, but, particularly in the early years there would also be substantial export to the United States northwest area. The applicant's evidence on nitrogen fertilizer supply and demand indicated that, while Western Canada currently has some 975 000 tonnes per year excess ammonia capacity, forecast demand in the combined Western Canada - U.S. northwest market would require additional capacity before 1985. Esso also believed that growth of demand for ammonia in Western Canada would in itself justify the proposed plant expansion. Neither Esso nor Sherritt Gordon saw excess capacity as a potential problem, even if allowance is made for Sherritt Gordon's planned expansion.

The Board believes that Alberta ammonia is likely to continue serving major parts of the U.S. market in the near term, and finds the applicant's demand forecasts and marketing plans to be reasonable.

7 IMPACT OF THE PROPOSED PROJECT ON ALBERTA'S ECONOMY

Esso provided an analysis of the proposed project's impact on the provincial economy, and also evaluated the project in a benefit-cost framework. The former analysis suggested three major impacts stemming from construction and operating expenditures: approximately $4147 million (in 1980 dollars) increase in gross provincial product; a potential increase in employment of some 15 700 man-years; and an addition to provincial government revenues of $600 million (in 1980 dollars).

In preparing its impact assessment, Esso assumed idle capacity in the Alberta economy, and therefore ascribed significant net benefits and multiplier effects to expenditures and additional employment in Alberta. The Board believes that the forecast high level economic activity makes it more appropriate to analyse Alberta project impacts in the context of full employment.

The applicant's benefit-cost analysis, which assumed that gas consumed by the project at the estimated border price could alternatively be sold in other Canadian markets at an equivalent price, indicated an undiscounted net social benefit of $1015 million (in 1980 dollars). The discounted net social benefit would be positive with discount rates of 5, 10, and 15 per cent. The project was also evaluated on the basis that all or a portion of the applied-for gas would be sold in export markets as an alternative to the Esso project. This analysis, too, suggested that the project would continue to yield a positive net social benefit.

The Board generally concurs with the applicant's evidence and believes the Esso project will generate a positive net benefit under any reasonable assumptions regarding ammonia and gas pricing.

8 OTHER MATTERS

Esso requested a permit for a term of 25 years. The Board believes, however, that a 20-year term for a project of this nature is more reasonable. Except where an applicant can demonstrate that a longer term is essential for project viability, the Board will not issue a permit exceeding 20 years.

Beyond this matter, however, the Board is satisfied that the proposed development meets the public interest with respect to Alberta and Canadian content, upgrading of resources, and economic viability. It is also satisfied that the project would be designed to meet all applicable environmental standards. Further, the Board believes that any adverse social impact of the project would be minimal.

9 FINDINGS AND DECISION

The Board finds that Esso's proposal would use gas efficiently and that it is in the public interest, insofar as it relates to present and future availability of gas and other factors. Accordingly, the Board is prepared, with the approval of the Lieutenant Governor in Council, to grant the application. The permit for the existing plant would authorize the use of up to 320 x 10^6 m^3 (11.3 x 10^9 standard cubic feet (scf)) of gas annually for the period ending 31 December 2000. The permit for the proposed new units would authorize the use of up to 671 x 10^6 m^3 (23.7 x 10^9 scf) annually for the period ending 30 June 2003. The permits would be in the forms shown in the attached appendices and would be subject to the terms and conditions contained therein as well as to any conditions imposed by the Lieutenant Governor in Council.

DATED at Calgary, Alberta this 9th day of September 1980.

V. Millard
Chairman

N. Berkowitz, P.Eng.
Vice Chairman

H. J. Webber, P.Eng.
Acting Board Member

APPENDIX 1 TO DECISION 80-17
FORM OF PERMIT FOR EXISTING UNIT

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit authorizing the use within Alberta of gas produced in Alberta in the production of ammonia

INDUSTRIAL DEVELOPMENT PERMIT NO. EC 80-1

WHEREAS Esso Chemical Canada has applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act (the Act), authorizing the use of gas produced in Alberta for the production of ammonia in Alberta; and

WHEREAS the Board upon inquiry into the application, is of the opinion that the granting of this industrial development permit for the use of gas as raw material and fuel in the production of ammonia is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council has given his approval by Order in Council, numbered O.C. and dated , authorizing the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to

Esso Chemical Canada (hereinafter called "the Permittee") authorizing the use of gas as raw material and fuel in the production of ammonia subject to the regulations and orders made pursuant to the Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use in Alberta by the Permittee of gas as raw material and fuel in the production of ammonia generally as described in the application of the Permittee dated April 25, 1980.

2. This permit is for the use by the Permittee at its ammonia production facility located in the North half of Section 17 and in Section 20, both in Township 56, Range 21, West of the 4th Meridian.

3. Subject to the conformity by the Permittee with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on December 31, 2000.

4. The quantity of gas that may be used per calendar year in the industrial operation referred to herein shall not exceed 320 million cubic metres.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37.4 megajoules per cubic metre.

6. All gas used in producing ammonia pursuant to this permit shall be measured by or on behalf of the Permittee and shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittee shall obtain the approval of the Board of any major changes in design of the ammonia production facility.

8. The Permittee shall operate the ammonia production facility in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of gas for the manufacture of ammonia and

(b) the maximum practical conservation of gas.

9. The Permittee shall not

(a) assign this permit, or

(b) release from his control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

10. (1) Attached hereto as Appendix A and made part of this permit is the order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the Order of the Lieutenant Governor in Council set out in Appendix A.

11. Where it appears to the Board or the Lieutenant Governor in Council that the Permittee has contravened or failed to comply with any term or condition contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and, with the approval of the Lieutenant Governor in Council, may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

12. Notwithstanding the provisions hereof, the Permittee shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of gas within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

V. Millard
Chairman

APPENDIX 2 TO DECISION 80-17
FORM OF PERMIT FOR NEW UNITS

IN THE MATTER of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970; and

IN THE MATTER of an industrial development permit authorizing the use within Alberta of gas produced in Alberta in the production of ammonia and urea,

INDUSTRIAL DEVELOPMENT PERMIT NO. EC 80-2

WHEREAS Esso Chemical Canada has applied to the Energy Resources Conservation Board for an industrial development permit, pursuant to section 42 of The Oil and Gas Conservation Act (the Act), authorizing the use of gas produced in Alberta for the production of ammonia and urea in Alberta; and

WHEREAS the Board upon inquiry into the application, is of the opinion that the granting of this industrial development permit for the use of gas as raw material and fuel in the production of ammonia and urea is in the public interest having regard to, among other considerations, the efficient use without waste of energy resources and the present and future availability of hydrocarbons in Alberta; and

WHEREAS the Lieutenant Governor in Council has given his approval by Order in Council, numbered O.C.   and dated   , authorizing the granting of the permit.

THEREFORE, the Energy Resources Conservation Board, pursuant to the provisions of section 42 of The Oil and Gas Conservation Act, being chapter 267 of the Revised Statutes of Alberta, 1970, hereby grants an industrial development permit to Esso Chemical Canada (hereinafter called "the Permittee") authorizing the use of gas as raw material and fuel in the production of ammonia and urea subject to the regulations and orders made pursuant to the Act and to the terms and conditions prescribed in this permit as follows:

1. This permit is for the use in Alberta by the Permittee of gas as raw material and fuel in the production of ammonia and urea generally as described in the application of the Permittee dated April 25, 1980.

2. The ammonia and urea production facilities shall be located in the North half of the South-west quarter of Section 17 and the North-east half of the South-east quarter of Section 18, both in Township 56, Range 21, West of the 4th Meridian.

3. Subject to the conformity by the Permittee with the terms and conditions hereof, this permit shall be for a term commencing on the date hereof and ending on June 30, 2003.

4. The quantity of gas that may be used per calendar year in the industrial operation referred to herein shall not exceed 671 million cubic metres.

5. The quantities of gas for the purpose of this permit shall be on the basis of a gas free of water vapour and having a higher heating value of 37.4 megajoules per cubic metre.

6. All gas used in producing ammonia and urea pursuant to this permit shall be measured by or on behalf of the Permittee and shall be separately reported to the Board in a manner satisfactory to the Board.

7. The Permittee shall obtain the approval of the Board of any major changes in design of the manufacturing unit.

8. (1) The Permittee shall satisfy the Board prior to December 1, 1980, that arrangements for the financing of its proposed project have been completed, unless upon application by the Permittee a later date is stipulated by the Board.

(2) The Permittee shall satisfy the Board prior to December 1, 1980, that construction of its proposed project has commenced or will commence and that construction of the proposed facilities will continue in accordance with the schedule described in the application dated April 25, 1980, unless upon application by the Permittee, later dates are stipulated by the Board.

(3) The Permittee shall satisfy the Board prior to April 1, 1983, that arrangements have been completed for the supply of gas for the operation of the ammonia and urea production facilities, unless upon application by the Permittee, later dates are stipulated by the Board.

9. During the construction of the proposed project, the Permittee shall inform the Board, on a semi-annual basis, of the progress of construction.

10. The Permittee shall operate the ammonia and urea production facilities in a manner that results in

(a) the maximum practicably obtainable efficiency in the use of gas for the manufacture of ammonia and urea, and

(b) the maximum practical conservation of gas.

11. The Permittee shall not

(a) assign this permit, or

(b) release from his control the operation of the plant,

without consent in writing of the Board, which may, with the authorization of the Lieutenant Governor in Council, be given by the Board upon application therefor.

12. (1) Attached hereto as Appendix A and made part of this permit, is the Order of the Lieutenant Governor in Council authorizing the granting of this permit.

(2) This permit is subject to the terms and conditions, if any, prescribed by the Order of the Lieutenant Governor in Council set out in Appendix A.

13. Where it appears to the Board or the Lieutenant Governor in Council that the Permittee has contravened or failed to comply with any term or condition contained in this permit or any relevant statutes or regulations of Alberta,

(a) the Board shall review the permit and, with the approval of the Lieutenant Governor in Council, may cancel the said permit or take such other remedial measures as considered suitable by the Board and the Lieutenant Governor in Council in the circumstances, or

(b) the Lieutenant Governor in Council may amend, vary, add to or replace any terms or conditions contained in this permit.

14. Notwithstanding the provisions hereof, the Permittee shall comply with the provisions of any Act, regulation, order or direction governing the drilling for, production, conservation, gathering, transportation, processing, purchasing, acquisition, sale, measurement, reporting, testing, supply or delivery of gas within the Province.

MADE at the City of Calgary, in the Province of Alberta, this day of

ENERGY RESOURCES CONSERVATION BOARD

V. Millard
Chairman